UPDATES ON FOUR CURRENT OFFICE TECHNOLOGIES

1. FAX MACHINES

Basic Idea behind Fax Machines

Fax machines have been around in one form or another for more than a century -- Alexander Bain patented the first fax design in 1843. If you look back at some of the early designs, you can get a very good idea of how they work today.

The standard fax machine works like a combination telephone & photocopier. The user places the documents into a document feeder on the sending machine, and then dials the telephone number of the receiving fax machine. A gear mechanism pulls the original document over an optical scanner. The scanner records variation between light and dark areas of the document as dots arranged in a series of rows or columns. A photoelectric cell covert the dots into electronic impulses, which are then transmitted to the receiving fax machine via telephone lines.

Types of Fax Machines

Fax Only- Stand-alone machines for sending, receiving & copying.
Multifunction fax machines - These models combine an impressive array of office tools in the same unit. They'll work as a network printer for PCs, scan and copy documents & answer the phone.

Most of the early designs involved a **rotating drum**. To send a fax, you would attach the piece of paper to the drum, with the print facing outward. The rest of the machine worked something like this:

- There was a small photo sensor with a lens and a light.
- The photo sensor was attached to an arm and faced the sheet of paper.
- The arm could move downward over the sheet of paper from one end to the other as the sheet rotated on the drum.

The **photo sensor** was able to focus in and look at a very small spot on the piece of paper -perhaps an area of 0.01 inches squared (0.25 millimeters squared). That little patch of paper would be either black or white. The drum would rotate so that the photo sensor could examine one line of the sheet of paper and then move down a line. It did this either step-wise or in a very long spiral.

To transmit the information through a phone line, early fax machines used a very simple technique: If the spot of paper that the photo cell was looking at were white, the fax machine would send one tone; if it were black, it would send a different tone. For example, it might have sent an 800-Hertz tone for white and a 1,300-Hertz tone for black.

At the receiving end, there would be a similar rotating-drum mechanism, and some sort of **pen** to mark on the paper. When the receiving fax machine heard a 1,300-Hertz tone it would apply the pen to the paper, and when it heard an 800-Hertz tone it would take the pen off the paper.

Fax machines are frequently used to send important documents such as resume.

Modern Fax Machines

A modern fax machine does not have the rotating drums and is a lot faster, but it uses the same basic mechanics to get the job done:

- At the sending end, there is some sort of **sensor** to read the paper. Usually, a modern fax machine also has a paper-feed mechanism so that it is easy to send multi-page faxes.
- There is some standard way to **encode** the white and black spots that the fax machine sees on the paper so that they can travel through a phone line.
- At the receiving end, there is a mechanism that **marks** the paper with black dots.

A typical fax machine that you find in an office is officially known as a **CCITT (ITU-T) Group 3 Facsimile machine**. The **Group 3** designation tells you four things about the fax machine:

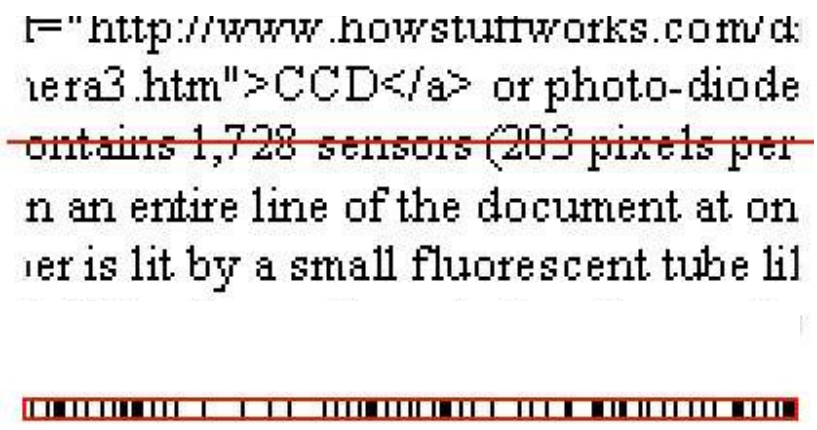
- It will be able to communicate with any other Group 3 machine.
- It has a horizontal resolution of 203 pixels per inch (8 pixels/mm).
- It has three different vertical resolutions:
    - **Standard**: 98 lines per inch (3.85 lines/mm)
    - **Fine**: 196 lines per inch (7.7 lines/mm)
    - **Super fine** (not officially a Group 3 standard, but fairly common): 391 lines per inch (15.4 lines/mm)

It can transmit at a maximum data rate of 14,400 bits per second (bps), and will usually fall back to 12,000 bps, 9,600 bps, 7,200 bps, 4,800 bps or 2,400 bps if there is a lot of noise on the line.

Panasonic KX-FB421 Fax/Copier machine

The fax machine typically has a CCD or photo-diode sensing array. It contains 1,728 sensors (203 pixels per inch), so it can scan an entire line of the document at one time. The paper is lit by a small fluorescent tube so that the sensor has a clear view.

The scanning process:



The scanner in a fax machine looks at one line of the sheet of paper. The scan line is shown here in red. It sees a group of black and white spots, shown blown up in the red rectangle at the bottom of the figure. It encodes the pattern of spots and sends them through the phone line.

The image sensor looks for black or white. Therefore, a single line of the document can be represented in 1,728 bits. In standard mode, there are 1,145 lines to the document. The total document size is:

1,728 pixels per line * 1,145 lines = approximately 2,000,000 bits of information

To reduce the number of bits that have to be transmitted, Group 3 fax machines use three different **compression** techniques:

- Modified Huffman (MH)
- Modified Read (MR)
- Modified Modified Read (MMR)

Choosing the Best Fax Machine

Fax machines are one of the fastest and securest means of communication between people, offices, and businesses. They have become a permanent fixture in businesses and many home-based businesses for sharing information and placing orders.

Color fax machines are not readily available and only work between two color fax machines.

Laser and Inkjet Fax Machines

There are many brands and types of fax machines on the market today. The major question is which fax machine you should buy. Of course this is a personal choice, however research is needed. Fax machine types include:

- Inkjet: uses ink droplets to transfer image to paper, best for less than 30 faxes per day, approximately 400 pages per cartridge
- Laser: uses light emitting diodes (LED) to transfer image to paper, best for large volume of incoming faxes, and approximately 5000 pages per cartridge

Choosing the Best Fax Machine

The major consideration is the purpose of the fax machine and uses in home or business; this will help you select the features you need. Feature considerations include:

- Quality: laser is best with 64 shades of grey and color, inkjet can do the same
- Page Memory: fax machine's ability to store pages, varies 20 – 1280 pages
- Transmission Speed: sending speed anywhere from 2 seconds to 30 seconds, transmission speed is controlled by speed of slowest fax machine involved, Modified-Modified Reader (MMR) provide faster speeds than older Modified Readers (MR), typical 36.6 kilo bits per second (kbps) or 6-10 seconds per page, 14.4 kbps much slower
- Dialing: speed dialing, delayed dialing
- Paper Handling: print last page first
- Paper Tray: 8.5 x 11 inch, legal size 8.5 x 14 inch
- Multifunction: faxing, scanning, enlargements, reducing size
- Quick Scan: scans page into memory before sending
- Dual Scan: send and receive at same time, good for large volume
- Paper: plain paper is the best option

All in One Fax Machines

All-in-One machines are more efficient for a small business and home office. They require less space and make it efficient for use by one person. The advantages and disadvantages of All-in-One Machines include:

Advantages:

- Printer, Fax, Copier, and Scanner in one machine
- No clutter of individual machines and electrical requirements on desks and tables
- Integration of features all in one machine

Disadvantages:

- All-in-one feature
- If printer breaks, you ability to print incoming faxes is eliminated
- You can lose all your capabilities at once if you have a problem with the machine common to all functions, such as power supply

Comparing Fax Machines

Once you have narrowed your fax machine choice(s) to either laser or inkjet, visit your local store and check out its(their) features:

- Controls: ease of use and layout
- Size: foot print - amount of space it takes up on desk or stand, legal size for large documents and books
- Resolution: at least 300 x 300 dpi
- Ink cartridge: cost
- Sharing: network and/or wireless capable
- Paper tray: at least 100 pages is best
- Speed: page transmission speed varies, high volume need faster speeds
- Sound: how noisy in operation
- Type: do you want a laser of inkjet fax machine

Choosing the best laser or inkjet fax machine is always a personal choice and requirements. You should weigh the advantages and disadvantages of each fax machine when comparing them to help you make your choice.

How Important is Connection Speed?

- Connection speed is measured in kilobits per second (Kbps).
- Most fax machines today can transmit at 9.6 Kbps or 14.4 Kbps.
- Faster models are also available that can transmit at 33.6 Kbps. At 9.6 Kbps, it takes between 9-15 seconds to print a page.
- 14.4 modems can print a page in between 6-10 seconds, while a 33.6 modem can do the job in 3 seconds.

How Much Memory?

- Memory enables a fax machine to temporarily store incoming or outgoing pages.
- Memory is critical for dual-access machines.
- During a paper jam, when you're filling the paper tray, or changing a toner cartridge, all incoming documents can be stored and printed when the machine's back online.
- If you expect high volumes of incoming documents, the more memory your fax machine has the better.
- The amount of memory required to hold a page depends on the density of the image, but generally you can expect 512 KB to hold about 20-25 pages.
- High-end machines may have a capacity of 100– pages or more.
- If you find that the memory of your machine is insufficient, many manufacturers offer the option to upgrade the memory capacity.

6 Key Features of Fax Machines

- Access user code
- Answering machine
- Automatic fax/telephone switch
- Automatic redialing
- One-touch speed dialing
- Timers

2. SCANNER

Introduction

Scanners have become an important part of the home office over the last few years. Scanner technology is everywhere and used in many ways: Scanners are available in four basic types:

- ***Handheld***
- ***Flatbed***
- ***Sheetfed***
- ***Film/Slide***

The basic principle of a scanner is to analyze an image and process it in some way. Image and text capture (optical character recognition or OCR) allow you to save information to a file on your computer. You can then alter or enhance the image, print it out or use it on your Web page.

1. Handheld scanners

Handheld scanners use the same basic technology as a flatbed scanner, but rely on the user to move them instead of a motorized belt. This type of scanner typically does not provide good image quality. However, it can be useful for quickly capturing text.

- *Simplest, smallest and cheapest*
- *Manually dragged across a page.*
- *Best for scanning images 4 inches wide or less.*

<u>Advantages</u> – Inexpensive and compact. Suitable for scanning text when high-resolution isn't critical. Good for making fast copies.

Disadvantages – Quality of the scan is often relatively low. You need a steady hand – it takes practice to scan a full-page document correctly.

2. Flatbed scanners

Canon CanoScan 9950F Flatbed Scanner, 4800 x 9600 dpi, 8.5" x 11.7, with USB Interface.

Also called desktop scanners, are the most versatile and commonly used scanners.

- *Larger & generally more expensive than sheetfeds*
- *The most popular type for general use.*
- *Resemble the top of a copier where object to be scanned is placed on a flat pane of glass and covered by a plastic top.*

Advantages – Flexible. Can scan flat originals of varied sizes. Good for books and small 3D objects.
Disadvantages – Unless equipped with an automatic document feeder, awkward for scanning multiple documents. Bulkier.

3. Sheet-fed scanners

Kodak i40 / 600 dpi / 24-Bit / 25 ppm / Sheetfed Scanner with Value Pack

Similar to flatbed scanners except the document is moved and the scan head is immobile. A sheet-fed scanner looks a lot like a small portable printer.

- *Slightly more expensive than handhelds*
- *Document feeder type that pulls the original through the machine across the scanning device.*
- *Some models scan a single sheet of paper at a time. Others have built-in document feeders that can scan multiple-page documents unattended.*

- *Advantages – Cheap & compact. Scans full-size documents easily.*
- *Disadvantages – Quality of scan can be inferior than flatbeds because the movement of the paper can cause distortions. Limited to scanning single sheets.*

4. Drum scanners

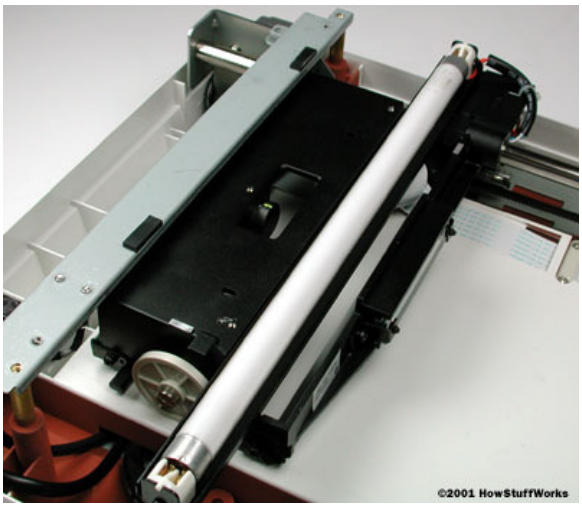
Drum scanners are used by the publishing industry to capture incredibly detailed images. They use a technology called a photomultiplier tube (PMT). In PMT, the document to be scanned is mounted on a glass cylinder. At the center of the cylinder is a sensor that splits light bounced from the document into three beams. Each beam is sent through a color filter into a photomultiplier tube where the light is changed into an electrical signal. Drum scanner can scan transparencies as well as prints or artwork.

Advantages – Produces sharp reproductions without distortions caused by reflected light.
Disadvantages – Expensive. Limited to slides and film.

The Scanning Process

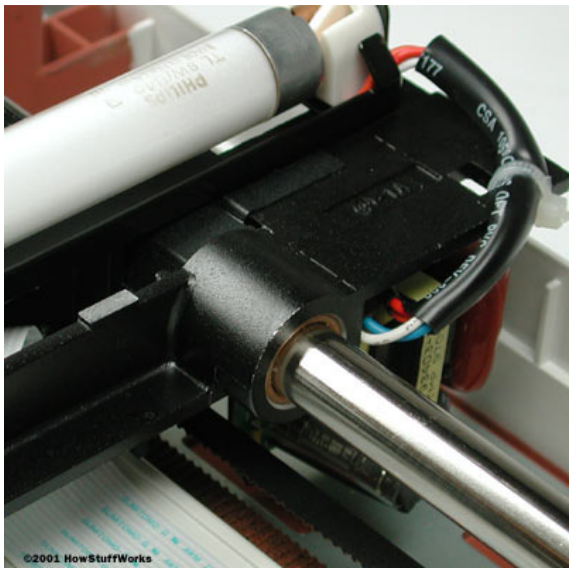
Here are the steps that a scanner goes through when it scans a document:

- The document is placed on the **glass plate** and the **cover** is closed. The inside of the cover in most scanners is flat white, although a few are black. The cover provides a uniform background that the scanner software can use as a reference point for determining the size of the document being scanned. Most flatbed scanners allow the cover to be removed for scanning a bulky object, such as a page in a thick book.



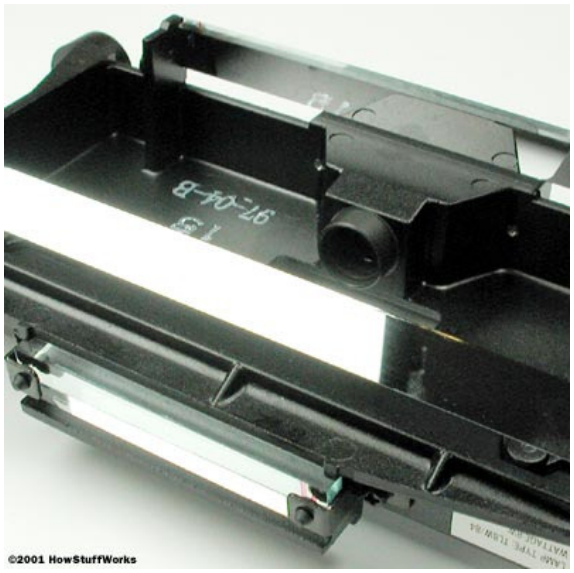
In the image above, you can see the fluorescent lamp on top of the scan head.

- A **lamp** is used to illuminate the document. The lamp in newer scanners is either a cold cathode fluorescent lamp (CCFL) or a xenon lamp, while older scanners may have a standard fluorescent lamp.
- The entire mechanism (mirrors, lens, filter and CCD array) make up the **scan head**. The scan head is moved slowly across the document by a **belt** that is attached to a stepper motor. The scan head is attached to a **stabilizer bar** to ensure that there is no wobble or deviation in the **pass**. Pass means that the scan head has completed a single complete scan of the document.



The stabilizer bar is very durable and tightly secured to the body of the scanner**.**

- The image of the document is reflected by an angled **mirror** to another mirror. In some scanners, there are only two mirrors while others use a three mirror approach. Each mirror is slightly curved to focus the image it reflects onto a smaller surface.
- The last mirror reflects the image onto a **lens**. The lens focuses the image through a **filter** on the CCD array.



Look carefully at the image above and you can see all three of the mirrors plus the lens assembly in this scan head.

The filter and lens arrangement vary based on the scanner. Some scanners use a **three pass** scanning method. Each pass uses a different color filter (red, green or blue) between the lens and CCD array. After the three passes are completed, the scanner software assembles the three filtered images into a single full-color image.

Most scanners today use the **single pass** method. The lens splits the image into three smaller versions of the original. Each smaller version passes through a color filter (either red, green or blue) onto a discrete section of the CCD array. The scanner combines the data from the three parts of the CCD array into a single full-color image.

Another imaging array technology that has become popular in inexpensive flatbed scanners is **contact image sensor** (CIS). CIS replaces the CCD array, mirrors, filters, lamp and lens with rows of red, green and blue **light emitting diodes** (LEDs). The image sensor mechanism, consisting of 300 to 600 sensors spanning the width of the scan area, is placed very close to the glass plate that the document rests upon. When the image is scanned, the LEDs combine to provide white light. The illuminated image is then captured by the row of sensors. CIS scanners are cheaper, lighter and thinner, but do not provide the same level of quality and resolution found in most CCD scanners.

Scanner Driver: TWAIN

TWAIN is a standard for getting input from image scanners: an image capture API for Microsoft Windows and Apple Macintosh operating systems.

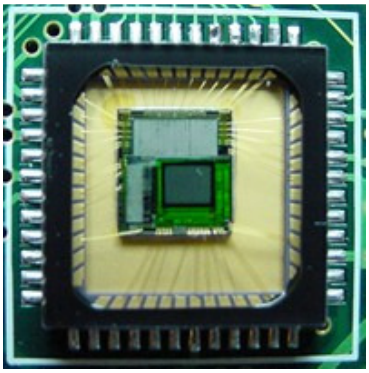
TWAIN is typically used as an interface between image processing software and a scanner or digital camera.

The word TWAIN is from the word "Technology Without An Interesting Name".

The disadvantage of TWAIN is that it does not separate the user-interface from the driver of a device. This makes it difficult to provide transparent network access.

3. DIGITAL CAMERA

Instead of film, a digital camera has a sensor that converts light into electrical charges.



A CMOS image sensor

The image sensor employed by most digital cameras is a **charge coupled device** (CCD). Some cameras use **complementary metal oxide semiconductor** (CMOS) technology instead. Both CCD and CMOS image sensors convert light into electrons. A simplified way to think about these sensors is to think of a 2-D array of thousands or millions of tiny solar cells.

Once the sensor converts the light into electrons, it reads the value (accumulated charge) of each cell in the image. This is where the differences between the two main sensor types kick in:

- A CCD transports the charge across the chip and reads it at one corner of the array. An **analog-to-digital converter (ADC)** then turns each pixel's value into a digital value by measuring the amount of charge at each photosite and converting that measurement to binary form.

CMOS devices use several transistors at each pixel to amplify and move the charge using more traditional wires. The CMOS signal is digital, so it needs no ADC

Advantages

Digital photography has many advantages over traditional film photography.

- Digital photos are convenient, allow you to see the results instantly, don't require the costs of film and developing, and are suitable for software editing and uploading to the Internet. While shooting on film will always have a place in the world of photography, digital models have taken over the consumer camera market almost completely.

- Take as many pictures as you want without worrying about wasting film. You can look at pictures right away and decide whether to keep them or delete them.

- Print only the images you want - you don't have to process whole rolls of film and then figure out where to store all the pictures.

Disadvantage

- A film camera can take a picture almost immediately when you press the button. Digital cameras, on the other hand, can take a few seconds, especially if they're making adjustments automatically.
- They also require more light than traditional cameras do.
- Sometimes, the abundant space on a memory card encourages people to take so many pictures that they're not sure what to do with them later.

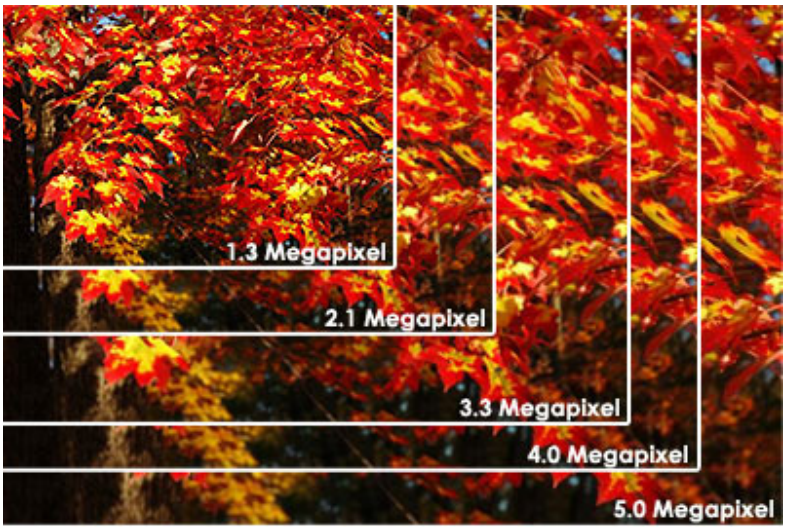
By keeping a few tips in mind, it's easy to overcome the disadvantages and get a lot out of your digital camera. The first step is to know the basics of how camera works. A digital camera is a lot like a film camera, but it uses a **sensor** and a **memory card** in place of film. When you take a picture, a **digital shutter** opens and exposes the sensor to light. The sensor reacts to the light, and the memory card stores the resulting picture.

Digital Camera Resolution

The amount of detail that the camera can capture is called the **resolution**, and it is measured in pixels. The more pixels a camera has, the more detail it can capture and the larger pictures can be without becoming blurry or "grainy."

Some typical resolutions include:

- **256x256** - Found on very cheap cameras, this resolution is so low that the picture quality is almost always unacceptable. This is 65,000 total pixels.
- **640x480** - This is the low end on most "real" cameras. This resolution is ideal for e-mailing pictures or posting pictures on a Web site.
- **1216x912** - This is a "megapixel" image size -- 1,109,000 total pixels -- good for printing pictures.
- **1600x1200** - With almost 2 million total pixels, this is "high resolution." You can print a 4x5 inch print taken at this resolution with the same quality that you would get from a photo lab.
- **2240x1680** - Found on 4 megapixel cameras -- the current standard -- this allows even larger printed photos, with good quality for prints up to 16x20 inches.
- **4064x2704** - A top-of-the-line digital camera with 11.1 megapixels takes pictures at this resolution. At this setting, you can create 13.5x9 inch prints with no loss of picture quality.



The size of an image taken at different resolutions

High-end consumer cameras can capture over 12 million pixels. Some professional cameras support over 16 million pixels, or 20 million pixels for large-format cameras. For comparison, Hewlett Packard estimates that the quality of 35mm film is about 20 million pixels.

Storing Digital Photos

Most digital cameras have an LCD screen, so you can view your picture right away. This is one of the great advantages of a digital camera -- you get immediate feedback on what you capture. Of course, viewing the image on your camera would lose its charm if that's all you could do. You want to be able to load the picture into your computer or send it directly to a printer. There are several ways to do this.

Early generations of digital cameras had **fixed storage** inside the camera. You needed to connect the camera directly to a computer with cables to transfer the images. Although most of today's cameras are capable of connecting through serial, parallel, SCSI, USB or FireWire connections, they usually also use some sort of removable storage device.

A CompactFlash card

Digital cameras use a number of storage systems. These are like reusable, digital film, and they use a caddy or card reader to transfer the data to a computer. Many involve fixed or removable flash memory. Digital camera manufacturers often develop their own proprietary flash memory devices, including SmartMedia cards, CompactFlash cards and Memory Sticks. Some other removable storage devices include:

- Floppy disks
- Hard disks, or microdrives
- Writeable CDs and DVDs

No matter what type of storage they use, all digital cameras need lots of room for pictures. They usually store images in one of two formats -- TIFF, which is uncompressed, and JPEG, which is compressed, but some use RAW format. Most cameras use the JPEG file format for storing pictures, and they sometimes offer quality settings (such as medium or high). The following chart will give you an idea of the file sizes you might expect with different picture sizes.

Image Size	**TIFF** (uncompressed)	**JPEG** (high quality)	**JPEG** (medium quality)
640x480	1.0 MB	300 KB	90 KB
800x600	1.5 MB	500 KB	130 KB
1024x768	2.5 MB	800 KB	200 KB
1600x1200	6.0 MB	1.7 MB	420 KB

To make the most of their storage space, almost all digital cameras use some sort of data compression to make the files smaller. Two features of digital images make compression possible.

Tips for Buying the Right Camera

Just five years ago, buying a digital camera that could take photos of the same visual quality as a film camera could cost more than RM3,000. But prices have dropped tremendously, and camera quality has increased. Today cameras in the RM1,000 range are near-professional quality, and all but the cheapest digital cameras produce decent looking images.

The basic attribute of a digital camera that determines image quality is its **megapixel** rating. This number refers to the amount of information that the camera sensor can capture in a single photograph. Cameras with high megapixel ratings take larger pictures with more detail. Those photos will also look better when printed, especially in bigger sizes. At five megapixels, image quality gets in the neighborhood of film. If you're willing to spend about RM500 on a digital camera, then it's difficult to find a model that doesn't have five megapixels. These cameras are fine for most people who just want to take a few family snapshots or capture vacation memories. The more you spend, the more megapixels you get. In the RM1,000 to RM3,000 range, you can expect to find cameras with anywhere from eight to 12 megapixels. If you plan to take serious artistic photos, sell prints of your photos, or post large, high-resolution photos on the Internet, this is the range for you.

IA few of the many camera choices out there, clockwise from left: Canon EOS-5D, Canon PowerShot S2 IS, Nikon D200 and Panasonic Lumix

There are many additional features available on digital cameras, including image stabilization, on-board image editing, color correction functions, auto-bracketing and burst

modes. A lot of these can be handled by image editing software, and so they can be unnecessary (and often inferior) when built into a camera. Burst mode, macro mode and image stabilization are probably the most useful extra features, but the best way to find out which camera is best for you is to explore any of the numerous digital photography magazines and Web sites that offer comparisons and user reviews of hundreds of different cameras.

Camera Settings and Modes

With a decent digital camera and a bit of practice, anyone can take acceptable quality photos with the camera set on **full automatic**. You can even take a bunch of so-so pictures and make them look acceptable later with image editing. But to really wring every ounce of ability out of your camera and produce truly beautiful photographs, you'll need to learn a few things about the manual settings. Keep in mind that lower-end cameras might not have manually adjustable settings.

When you're changing the settings on a camera, you're trying to find the proper **exposure** for the subject and lighting conditions. Exposure is the amount of light hitting the camera's sensor when you take a photo. Generally, you will want the exposure set so that the image captured by the camera's sensor closely matches what you see with your eyes. The camera tries to accomplish this when it's on full automatic mode, but the camera is easily fooled and a little slow, which is why manual settings usually produce better pictures.

As you get more familiar with your camera, you can play with different exposures for different effects. There are times when auto is better - something happens suddenly and you only have a few seconds to get your photo. Just flip to auto and take a picture. Getting the shot with a slightly incorrect white balance and poor field depth is better than standing there fiddling with f-stop settings while Bigfoot strolls back into the forest.

To adjust exposure, you can tweak two different settings: **aperture** and **shutter speed**. Aperture is the diameter of the lens opening - a wider aperture means more light gets through. Aperture is measured in **f-stops**. Higher f-stop numbers mean a smaller aperture. The aperture setting also affects depth of field, the amount of the photograph that is in focus. Smaller apertures (higher f-stops) give longer depth of field. A person in the foreground and the cars 20 feet behind her could all be in focus with a small enough aperture. A larger aperture results in a shallow depth of field, which you normally use for close-up shots and portraits.

OTHER TIPS:

Once you have a feel for the settings, there are a few other steps you can take to make get more from your camera:

- **Hold the camera steady.** Since digital cameras require more light than film cameras, the shutter is often open longer. This can cause your pictures to blur. Using a tripod or monopod can help you keep your camera still.
- **Lock the focus.** On most auto focus digital cameras, pressing the button halfway will focus the camera. You can hold the button in this position until you're ready to take the picture. This can further reduce the time between when you press the button and when the shutter opens. It can also let you keep the camera in focus while re-framing the picture.
- **Use optical -- not digital -- zoom.** An optical zoom physically changes how far the lens is from the sensor. Digital zoom, on the other hand, simply forces the camera to create the picture from one portion of the sensor rather than the whole thing. You can do the work of a digital zoom yourself using image editing software, and you can often do it better than your camera can.
- **Preserve the battery.** It's tempting to use the LCD screen as a viewfinder. Sometimes, it's the only good way to see what you're taking a picture of. But the LCD screen uses lots of battery power. If possible, set your camera to preview pictures on the screen after you take them but to keep it turned off the rest of the time.
- **Delete unwanted pictures right away.** Unless you're quickly taking several pictures of the same scene, look at your picture as soon as you take it. You'll know right away if you need to take another. If you do, go ahead and delete the one you don't like. If you wait to review all your pictures and delete unwanted ones, your camera will probably insert new pictures into the spaces the deleted ones left. This can make it harder to sort and organize your pictures later.
- **Maximize your storage space.** Most cameras come with a very small memory card. Upgrade it to something larger, and keep the old one as an emergency backup. You can fit more pictures onto your card by lowering the resolution or increasing the compression that the camera uses. Even if your camera has a high megapixel rating, you can manually set it to take slightly lower-quality pictures. You should still be able to make average-sized prints with little to no loss of quality.

Familiar Terms

- **Digital camera** - a camera that captures and stores still images as digital data instead of on photographic film.

- **Image Compression** - Compressing an image reduces the amount of memory that is taken up by the image and allows for more images to be stored on a memory card or disk. The trade-off for image compression is the loss of image quality.

- **Image resolution** - The amount of data stored in an image file, measured in pixels per inch (ppi).

- **JPEG** - A very popular digital camera file format that uses compression to reduce file sizes. Developed by the Joint Photographic Experts Group.

- **TIFF** - Tagged Image File Format, a file format for exchanging bitmapped and grayscale images among applications.

- **Pixel** - A single dot on a computer display or in a digital image.

- **Compact Flash** - A popular form of flash storage for digital cameras.

- **Frame Rate** - The number of pictures that can be taken in a given period of time.

- **Megapixel** - An image or image sensor with over one million pixels.

- **Noise** - Pixels on the image sensor that misread the light.

- **Red-eye reduction mode** - A mode that fires a preliminary flash to close the iris of the eye before firing the main flash to take the picture.

- **Viewfinder** - A separate window on the camera through which you look to compose images.

- **LCD** - The LCD of a digital camera is the screen used to review, preview and even act as a large size viewfinder.

- **Digital Zoom** - The camera takes a portion of the image and magnifies it digitally. Unfortunately, these images get fuzzy in a hurry because a smaller amount of information is being used to create a larger image because the camera has to create the missing information.

- **Optical Zoom** - A zoom lens that achieves its magnification by moving parts of its lens forward or backwards. This usually takes place inside the camera, out of view, but can often be heard as the sound of a small motor and other mechanical parts.

- **Top Menu –** The Top Menu is the beginning menu displayed in on the monitor screen.

4. PERSONAL DIGITAL ASSISTANT (PDA)

The main purpose of a personal digital assistant (PDA) is to act as an electronic organizer or day planner that is portable, easy to use and capable of sharing information with your PC. It's supposed to be an extension of the PC, not a replacement.

PDAs, also called **handhelds** or **palmtops**, have definitely evolved over the years. Not only can they manage your personal information, such as contacts, appointments, and to-do lists, today's devices can also connect to the Internet, act as global positioning system (GPS) devices, and run multimedia software. What's more, manufacturers have combined PDAs with cell phones, multimedia players and other electronic gadgetry. As its capabilities continue to grow, the standard PDA device is changing.

A typical PDA: the Hewlett Packard iPAQ Pocket PC.

The Birth of the PDA

Predecessors of the modern PDA include the Psion Organiser and the Sharp Wizard. These early devices, which were intended to be portable computers, came out in the mid- to late 1980s. They included small keyboards for input, a small display, and basic features such as an alarm clock, calendar, telephone pad and calculator. Support for specialized software such as games and spreadsheets was also included. The Psion Organiser II, released in 1986, was especially popular and more than half a million were sold.

In 1993, Apple introduced the Newton MessagePad at a price of RM2,000. It provided users with an electronic notepad, to-do list, calendar, telephone log and address file applications. Some of the Newton's innovations have become standard PDA features, including a pressure-sensitive display with stylus, handwriting recognition capabilities, an infrared port and an expansion slot. However, the Newton MessagePad was too big, expensive and complicated, and its handwriting recognition program was poor. Apple discontinued the Newton in 1998.

The original PalmPilot was introduced in March of 1996 by Palm Computing (owned by U.S. Robotics at the time). It cost less than RM1,000, ran on its own Palm operating system, fit in a shirt pocket and synchronized with consumers' PCs. The PalmPilot ran for weeks on AAA batteries, was easy to use, and could store thousands of contacts, appointments and notes. Part of its small size was due to the lack of a keyboard. Users used a stylus and the **Graffiti** language to input data.

Not to be outdone, Microsoft had been working on various forms of portable computing, including PenWindows and tablet computers. In November 1996, Microsoft released **Windows CE**, its first operating system for mobile devices. A number of manufacturers, such as HP, Compaq and Casio, adopted it for what was dubbed the Handheld PC - the first Windows-based competitor for the PalmPilot.

Types of PDAs

- **Traditional PDAs**

Today's traditional PDAs are descendents of the original PalmPilot and Microsoft Handheld PC devices. Palm devices run the **Palm OS** (operating system), and Microsoft Pocket PCs run **Windows Mobile**. The differences between the two systems are fewer than in the past.

- **Palm PDAs**

Most Palm devices are made by palmOne, which offers the Zire and Tungsten product lines. The company formed in 2003 when Palm Computing acquired Handspring, Inc. Sony, which produced the Palm-based CLIE, stopped producing PDAs in 2005.

palmOne Tungsten T5 Handheld

Known for their ease of use, Palm OS PDAs have:

- A vast library of third-party applications (more than 20,000) that you can add to the system (most devices come bundled with e-mail, productivity and multimedia software)
- An updated version of the Graffiti handwriting-recognition application
- Synchronization with both Windows and Macintosh computers using the Palm Desktop
- Smaller displays than Pocket PCs to accommodate a dedicated Graffiti area on the device (Some higher-end Palm devices now incorporate a virtual Graffiti area in the display, resulting in a larger display area.)

- **Pocket PCs**

Pocket PC is the generic name for Windows Mobile PDAs. Their standard features include:

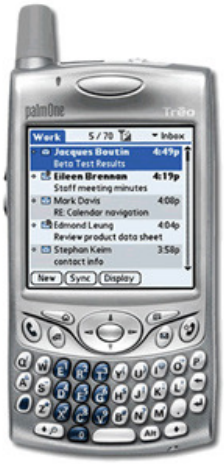
- Pocket versions of Microsoft applications such as Microsoft Word, Excel, and Outlook (note that some formatting is lost between Pocket and standard versions of documents)
- Synchronization with Microsoft Outlook on a Windows PC (synchronization with e-mail systems other than Outlook or with Macintosh computers requires additional software)

- Three handwriting-recognition applications: Transcriber, Letter Recognizer (similar to the new version of Graffiti), and Block Recognizer (similar to the original Graffiti)
- A virtual writing area, which maximizes the display size
- Windows Media Player for multimedia content

- **Smartphones**

A smartphone is either a cell phone with PDA capabilities or a traditional PDA with added cell phone capabilities, depending on the form factor (style) and manufacturer. Characteristics of these devices include:

- A cellular service provider to handle phone service (As with cell phones, you typically purchase a cellular plan and smart phone from the service provider.)
- Internet access through cellular data networks
- Various combinations of cell phone and PDA features, depending on the device (for example, not all smart phones offer handwriting-recognition capabilities)
- A number of different operating systems, including Windows Mobile Pocket PC Phone Edition, the Palm OS, the Blackberry OS for Blackberry smart phones, and the Symbian OS for smart phones from Panasonic, Nokia, Samsung and others



palmOne Treo 650 Handheld

Related devices include ultraportable computers, smart watches and multimedia players. Ultraportable computers range in weight from less than a pound to about three pounds, come with a full desktop operating system (such as Windows XP), and include a small keyboard. Smart watches offer some PDA functions in a wristwatch form factor. Microsoft's SPOT (Smart Personal Objects Technology)-based watches, for example, can receive MSN Direct information such as weather and news. They can also receive calendar information and personal messages. Some multimedia players can combine the functions of a PDA with multimedia features, such as a digital camera, an MP3 player and a video player.

PDA Features

Even the most basic PDAs handle standard personal information management (PIM) functions, run application software and synchronize with PCs. Here are some additional details about these basic features.

Handle Standard PIM Functions

All PDAs come with some kind of personal information management (PIM) software that typically handles the following tasks to keep you organized:

- Store contact information (names, addresses, phone numbers, e-mail addresses)
- Make to-do lists
- Take notes
- Track appointments (date book, calendar)
- Remind you of appointments (clock, alarm functions)
- Perform calculations

Run Application Software

PDAs can run specialized software applications:

- Windows Mobile devices come with Pocket versions of Word, Excel, Internet Explorer and Outlook (includes e-mail and PIM functions), along with Windows Media Player and voice memo recording.
- Most Palm OS devices include applications such as DataViz Documents to Go (compatible with Microsoft Word, Excel, and PowerPoint), palmOne Media (for photos and video), VersaMail e-mail software and web-browsing software.
- All types of devices can run other kinds of software including games, multimedia, expense, diet and exercise, travel, medical, time and billing, and reference.

Synchronize With PCs

Because PDAs are designed to complement your PC, they need to work with the same information in both places. If you make an appointment on your desktop computer, you need to transfer it to your PDA; if you jot down a phone number on your PDA, you should upload it later to your PC.

Synchronization software on the PDA works with companion software that you install on your PC. Microsoft Pocket PC devices use ActiveSync and Palm OS devices use HotSync synchronization software. On your computer, you also need an application like Microsoft Outlook or the Palm Desktop that holds PIM information on the PC side.

The beauty of synchronization is that you always have a backup copy of your data, which can be a lifesaver if your PDA is broken, stolen, or completely out of power.

Common PDA Functions

Today, most PDAs incorporate wireless and multimedia functions of some type. Functions found on most (but not necessarily all) devices include:

- Short-range wireless connectivity using Infrared (IR) or Bluetooth technology, IR is found on most PDAs and requires a clear line of sight. It's commonly used to sync with a notebook computer that has an IR port. Bluetooth wirelessly connects (it's a radio frequency technology that doesn't require a clear line of sight) to other Bluetooth-enabled devices, such as a headset or a printer.
- Internet and corporate network connectivity through Wi-Fi and wireless access points
- Support for Wireless WAN (Wide Area Networks); the cellular data networks that provide Internet connectivity for smart phone devices
- A memory card slot that accepts flash media such as CompactFlash, MultiMediaCard, and Secure Digital cards (Media cards act as additional storage for files and applications.)
- Audio support for MP3 files and a microphone, speaker jack and headphone jack

SanDisk 256 MB Secure Digital Card

Bells & Whistles

High-end PDAs offer multimedia, security and add-on features not found on less expensive devices:

- A Secure Digital Input/Output (SDIO) card slot for add-on peripherals contained in an SDIO card, for example, a Bluetooth card, a Wi-Fi card, or a GPS (global positioning system) card
- Built-in GPS capabilities
- A built-in digital camera for snapping digital images and capturing short videos (The quality will not be as good as that of a dedicated camera.)
- Integrated security features such as a biometric fingerprint reader